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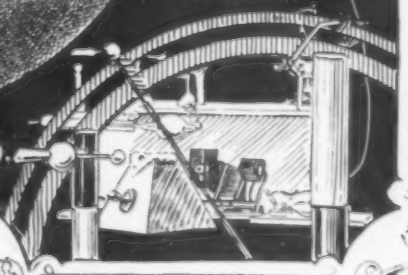
THE AMERICAN X-RAY JOURNAL

A MONTHLY DEVOTED TO THE PRACTICAL APPLICATION OF THE NEW SCIENCE AND TO THE PHYSICAL IMPROVEMENT OF MAN.



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RADIANCE APPROACHING THE MAXIMUM, ITS PRODUCTION AND USES.

WM. W. GRAVES, M. D., ST. LOUIS, MO.

In my Preliminary Report on "A Method of Overcoming High Resistance in Crooks' Tubes; A Possible Step toward Maximum Radiance," which appeared in THE AMERICAN X-RAY JOURNAL for April, 1898, the following observation was made:

"Whether for fluoroscopic or cathodographic work, approaching maximum radiance is always to be desired. A tube which gives only fair radiance has little practical value, other than from development by usage it may attain high efficiency."

High efficiency may be secured in any good tube by repeated use, thus assuring continued development in tube life, and may be more quickly attained by using tubes which have been exhausted to the highest possible point.

All authors, users and makers practically agree that continued usage engenders a vacuum resistance, which, in time, will become impassable, and if the various measures for the control of this resistance as engendered by usage fail, there is but one thing to do—have the tube re-exhausted.

Morgan's experiments with extreme exhausted tubes, and since Roentgen's discovery, experiments of Thomas A. Edison and others, tend to confirm the commonly accepted belief, that through an extremely exhausted tube no discharge will pass. My experiments during the last six months with heretofore believed to be "dead tubes" as described in my preliminary report, and some recent experiments with tubes exhausted to the highest possible point, confirm me in the belief that usage does not engender a resistance which may not be successfully overcome, and that it is not possible by true pump exhaustion to exhaust a tube to a point through which no discharge will pass; that the greater the resistance afforded by any given tube, however engendered, whether from usage or extreme pump exhaustion, the higher will be its efficiency when its resistance is overcome; that the true test for tube resistance is that resistance shown when the tube is connected, pos-

itive to cathode, and negative to anode; that is to say, reversed, and that it being possible to overcome in a satisfactory manner resistance in the tube reversed, it is also possible to do so in the tube properly connected.

Now, if it is a fact, and experience so teaches, that the greater the resistance as afforded by the vacuum tube, the higher will be its efficiency when the resistance is overcome, it must follow that approaching maximum radiance will not be attained until it is possible to overcome all resistance. Therefore, those tubes that are set aside for rest, and those tubes that are returned to the makers for re-exhaustion, are the very tubes which if their resistance, can be successfully overcome—are capable of affording nearest approach to maximum radiance.

If there were a way of overcoming resistance in such tubes, approaching maximum radiance would be the rule, and not, as now, rarely seen. I believe there is a way, but it is not found by using tubes which have regulating devices, for in such tubes no sooner does the radiance begin to approach the maximum than its penetration is lowered by the use of the "extinguisher."

It is evident that the expressions from various authors, the personal experience of users, the advice of makers, a demand for and the sale of, the various adjustable vacuum tubes, all bear witness to the universally, accepted facts: That usage does increase resistance; that from continued use resistance does become so great that all heretofore known procedures for the control of vacuum as engendered by usage fail, and that when the various procedures do fail there is but one thing to do—have the tube re-exhausted.

The seemingly correct method of operating the tube and proper use of current interrupters, the proper degree of reversal, the application of tin foil, and the self evident value of efficient generating apparatus, have all been worked out and given what I am led to believe is the true position of each as an essential for success in readily reviving so-called dead tubes, solely by experimenting with the so-called dead tubes, as may be seen by carefully reading my "Preliminary report on a method of overcoming high resistance in Crookes' tubes; a possible step toward maximum radiance."

The probable reason why approaching maximum radiance is not universally had is on account of the heretofore believed unconquerable resistance as engendered by usage. In my preliminary report certain specific conclusions are established concerning the effect on tube resistance by interrupting the positive or negative discharge, reversal, application of tin foil, and the necessary technique required is indicated therein, and the following conclusions are drawn:

"That success in overcoming the heretofore believed high vacuum, as engendered by usage, will depend upon proper technique in current and tube manipulation; that the trouble is not in the tube per se: that a Crookes' tube which has once afforded radiance should continue to do so as long as its electrodes are not disintegrated or its vacuum destroyed; that the so-called high vacuum, as engendered by usage, is most likely a myth; that a tube which has once afforded radiance requires neither baking, boiling, rest nor re-exhaustion; that the longer a tube is used the greater it grows in efficiency; that usage is to the Crookes' tube what the crucible is to crude gold; that maximum radiance has never been seen, and that the way to maximum radiance may possibly be found in the overcoming of the heretofore believed impassable barrier of resistance, thus assuring continued development in tube life."

The universal attainment of a nearer approach to maximum radiance, is the only remaining requisite, and may be attained by better technique in current and tube manipulation, to the end that Roentgen's discovery may have the widest range of usefulness, be universally employed, and be made a necessary part of the armamentarium of every physician.

With more pertinacity than reason it is still claimed by some writers, specifically stated by certain tube and apparatus manufacturers, that tubes differing in efficiency are required for different work. For instance, if it is desired to make an exposure of the hand or forearm a tube of low resistance and efficiency is required, because when the vacuum is high the rays have much greater penetrating powers, but less photographic effect than they do when it is lower, because a radiograph of the hand can be made in much shorter time with sharp detail and strong contrast between bone and flesh if a low vacuum is used. On the other hand, for exposures of the denser portions of the extremities, trunk or head, a tube of higher vacuum and efficiency is required, though it is claimed that such a tube does not show as much contrast between bones and muscles as it penetrates both.

The truth of the matter is, that for all purposes for which Roentgen's light is now employed, whether fluoroscopic or cathodographic, whether we desire to examine the thicker or denser structures of the body, the nearer the light of any given tube approaches the maximum the better will be the result, and the more satisfactory will be the examination. No one has yet stated that too much could be seen with the fluoroscope; on the contrary, higher and still higher efficiency is universally sought for fluoroscopic work. Then why should any one believe, much less assert, that light can be made too penetrating for cathodographic work? The better the light, the greater the contrast, and the more the detail, irrespective of the portion of the body to be examined. The better the light, the shorter the exposure. The better the light, the greater the distance to be had between the tube wall and the subject. This latter fact alone is sufficient reason for desiring and requiring radiance approaching the maximum for all work. Long exposures with tube in close relation with the subject, inefficient generating apparatus and ordinary light, have been the causes of so-called x-ray burns. When the user of x-ray apparatus shall have ceased employing tubes of ordinary efficiency for any purpose whatever, and will use instead, tubes affording radiance approaching the maximum for all purposes, Roentgen's discovery will be universally employed, and the so-called x-ray burns will become ancient history, and those who shall still cling to the belief that x-rays do cause burns will have lost their last "prop," because there will be no burns.

It may be asked, what is considered radiance approaching the maximum? The maximum is not known, because the longer a tube is used the greater it grows in efficiency, but a minimum radiance for good x-ray work may be readily established. When a tube becomes available for good x-ray work its radiance should show the pulsations of the heart in a man weighing 150 pounds with clearness and distinctness five feet from the tube wall. The best light obtainable, the nearest approach to maximum, is the rule whenever fluoroscopic examinations are made, and it should also be the rule when we desire to show shadows in the completed print.

An x-ray print, if proper light and exposure is had, should show the different layers of clothing, the skin, the fat, the muscles, the bones, and bones through bones, the marrow and cancellated bone structure, and in certain poses the blood vessels, intermuscular spaces, the shading of the muscles, depending upon their densities, and tendons and their attachments. In sprains where rupture of ligaments has taken place the points of separation should be shown. The brain in its relations to the skull, the spinal cord and in one print in my collection may be seen what appears to be the gross structure of a portion of the cere-

bellum. Of the great and lasting benefit Roentgen's discovery has up to the present moment been to the medical profession, and, in turn, to mankind, it is not necessary at this time to speak. We have every reason to believe that fully one-half of the possibilities of this wonderful light are yet unknown.

In concluding I do so with the hope that radiance approaching the maximum shall be the rule, and the only radiance for all purposes wherein Roentgen's unparalleled discovery now is and may in future time be employed, and with all, that the man who pointed out the way, Dr. William Konrad Roentgen, may not be forgotten.

1943 North Eleventh Street.

TRAUMATIC NEURASTHENIA.

BY THOMAS H. MANLEY, M. D., NEW YORK.
Professor of Surgery, New York School of Clinical Medicine.

Read before the seventh annual meeting of the New York State Association of Railway Surgeons, held at the Academy of Medicine, in New York City, November 16, 1897, and published in the International Journal of Surgery.

[This article in its entirety is reproduced in *The Atlantic Medical Weekly* for May. The subject is one of general interest. We reproduce only that portion of the article which refers to the x-rays.]

The surgeon in such a dilemma now turns to the latest and one of the most invaluable gifts of modern science, to the utilization of the Roentgen rays, that he may critically inspect the naked framework of the bones, and spare his patients the dangers of sanguinous surgery. But, unfortunately, here disappointment may await him, for the skiagraph is neither a positive nor definite resource in a considerable number of osseous disorganizations which are not readily detected by ordinary means. For example, quite a few cases have been reported where it has pointed to cleavage and rents in bones that did not exist, and vice versa, indicated osseous perfection where crepitus and mobility established beyond question the presence of fractures. Speaking from an abundant experience with the radiograph, Tracy, of Boston, says: "While much has been gained in accuracy of diagnosis by the aid of x-ray pictures, there is one branch of practical medicine where harm is threatened by their employment. I refer to medical jurisprudence. * * *

Their indiscriminate admission will hurt the cause of justice, because they can easily lead to fallacy and error." He goes on to show where the deformity of a Colles' fracture may be photographed in the normal limb.

Dr. P. M. Jones is more optimistic and says: "Here we have an agent which cannot err; if it gives an answer at all, it must be truthful and shows to the examiner the actual conditions." *Journal of the American Medical Association*, November 6, 1897. The former is a practical surgeon and the latter a teacher of electro therapeutics. Possibly sometimes error comes through want of skill in photographing; but when the sketching is done by experts, ignorance cannot be charged. And these are the very instances where the greatest fallacies have been demonstrated. Dowd has lately verbally reported a case of fracture of the leg, three days old. The patient, inspired by curious motives, had the limb skiagraphed; but the pictures were identical in both tibiae and he refused to pay the bill for professional attendance on the ground that he had no fracture.

The past summer at the University Hospital, London, it was my privilege to witness an operation by Mr. Barker, on a girl's hip. It was a case of old dislocation. A large, well developed x-ray photograph showed the head of the femur resting on the dorsum ilii, a deep, hollow cavity marking the site of the femoral head was in evidence, and the acetabulum was entirely obliterated by absorption, a smooth, hard surface only

remaining. I saw a somewhat similar case at the Laraboisiere in Paris, where the ray exhibited a subcoracoid dislocation of the humerus. In vain varied and repeated efforts were made to reduce it. Section showed no luxation at all, but a fracture through the anatomical neck. The skiagraph is the most valuable diagnostic aid we possess, and in conjunction with other resources of great assistance, but alone unreliable.

After dislocation of a limb, one of four things may occur:

1. It may be overlooked; something which happens oftener than is commonly supposed.

2. It may be reduced; the ordinary event.

3. It may be irreducible; quite unusual.

4. It may be reducible, but can not be retained; rare in most articulations, but common in one.

5. Exclusive of scapulo-clavicular dislocations, which as a class can not be retained after reduction, there are others in which reduction can not be maintained because of a chipping off or fracture of the rim of the mortice.

That a person may go about unconscious of a luxation goes to show that dislodgement of a bone from its socket is not always incompatible with the retention of a fair degree of function remaining. This is notoriously the case in the humero-scapular and claviclo-scapular luxations. Dislocations of the acromial end of the clavicle, when complete, are rarely reducible and seldom or never can be retained.

Failure of reduction or retention invariably implies permanency of defect in a limb, though rarely to such a degree as to incapacitate one from his ordinary employment, if this does not entail heavy labor.

By the former we designate those traumatisms in which the disorganization of bones is the dominant factor, as in Pott's or Colles' fracture, or fractures of the humerus, with simultaneous dislodgment of the scapular head; a condition readily detected when impaction is absent.

Dislocation fracture is one which is produced by the head of the bone impinging on the border or margin of the mortice or joint-hollow. The best description of this important lesion is given by Senn, who collected twenty-eight cases, and more recently by Dr. Edmund Andrews, of Chicago, who designates this "rim-fracture." (Fractures of the Rim of the Acetabulum and the Margins of other Joints Complicating Dislocations. *International Clinics*; Vol. VIII., 7th series, October, 1897.) In these cases reduction after the bone fails, because of loss of osseous support. Accuracy of diagnosis in this class is of the highest importance because of its bearing on prognosis; and here the Roentgen rays render possible the precise recognition of the lesion, without division of the soft parts, a boon of priceless value.

REGENERATING X-RAY TUBES. Graves. Lond. *Elec. Rev.*, June 10; abstracted briefly from THE AMERICAN X-RAY JOURNAL, April.—Dead tubes may be resuscitated by reversal, separate gaps and tin foil on the cathode end of the tube. In tubes of ordinary resistance the direct resistance is about three times the reversed and when the current refuses to pass in the proper direction it can probably be passed in the reverse direction; but if this is impossible then success will usually be attained by introducing a spark gap between the tube and the negative terminal of the generator; a spark gap at the negative pole reduces the resistance, while at the positive pole it increases it; tubes that have been thus resuscitated are far more efficient than new tubes which have not yet become dead.

PRACTICAL X-RADIANCE.

BY J. M. SCOTT, M. D., KANSAS CITY, MO.

The power of all x-ray machines are rated according to the lengths of spark they will give. According to experience this has less to do with their actual capabilities than the volume of spark. In an inducting coil the length of spark it will give is governed by the length of wire and number of turns in the secondary. The volume of spark is governed by the size of the wire in the secondary. It is much cheaper to make a coil which will give a twelve inch spark of small volume than with a large volume. A coil with the secondary wound with a size number thirty-six wire, which is a small size, will give a spark of small volume, while a coil wound with a number thirty-two wire in the secondary will give a very large volume.

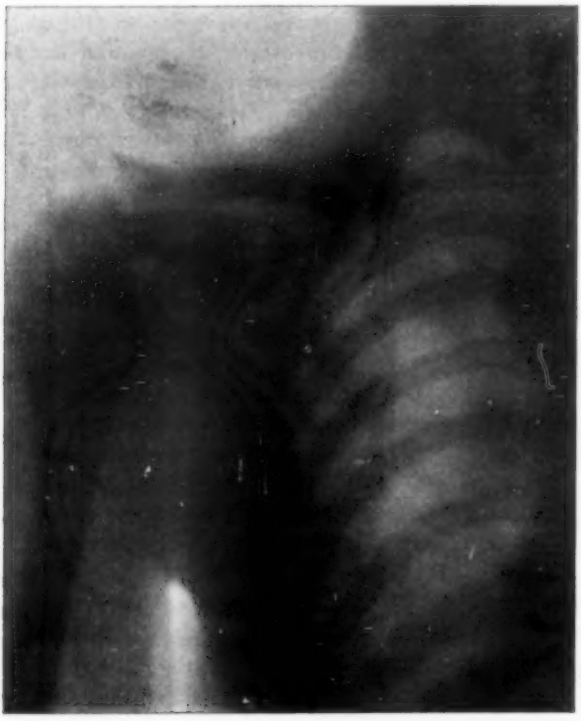

FIG. 1.

It will take at least four times the weight of number thirty-two wire to give a twelve inch spark that it will of a number thirty-six. In using a Crookes tube the pressure or voltage is to overcome the resistance of the vacuum in the tube between the internal electrodes. When you have sufficient voltage to force all the current your machine will give through the tube at the correct vacuum for the work you wish to do, that is all that is necessary; any more than this simply heats the platinum electrode to such a high heat that it will melt if you do not cut down your current by some means, or short circuit part of it.

The more volume of current you have the more voltage it will require to force it through the same tube—this is according to Ohms' law, that one volt will force one ampere through one ohm of resistance. Now to force more current, or say two amperes through one ohm of resistance, it will take two volts.

The power of x-ray depends on the volume of current you pass through your tube at the correct vacuum. By experiments I have found I can get as good, if not better, results with the fluoroscope and take as good a picture with the same length of exposure using the same tube in both experiments with an eight inch spark coil wound with a number thirty-two secondary which gives a large volume of current as I can with a twelve inch spark coil wound with a number

thirty-six secondary which gives a small volume of current.

In order to get penetrations with a tube we must have a vacuum which will back up about a three inch spark. I do not find it practical to use a higher vacuum than this, since, if you do it will make the bones nearly as transparent as the flesh; both with the fluoroscope and radiograph, then in using it to photograph through the trunk you will get very little contrast in your negative and consequently a poor picture. If it is true the molecules of residual air in the tube become charged with electricity and pass at a high velocity from one part of the tube to another, the reason a high vacuum gives more penetration than a low one might be explained in this way: if the theory that the x-ray is produced by transverse vibrations or pulses in ether, somewhat like light, but the vibrations are shorter and much more frequent, and the x-ray vibrations are caused by the electrified molecules in the tube striking some obstruction which is generally the platinum disc, then the harder these atoms strike the platinum the greater force and penetration will be given the x-ray vibrations. The higher the vacuum in the tube the less will be the number of molecules, so those which are in motion can go a greater distance without colliding with others and therefore gaining a greater velocity than if the vacuum was lower and there were more molecules in the tube, consequently having a greater velocity they will strike the p'atinum harder and give off more penetrating x-rays.

FIG. 2.

To sum up, in order to produce a powerful x-ray with an induction coil and force it through a thick substance like the trunk of the body in a few minutes we must have a tube of high vacuum to get penetrations; to use this tube we must have a high voltage current such as will throw a spark across an air gap

ten to fifteen inches long, then a current of large volume, such as given from an induction coil with the secondary wound with a number thirty-two wire.

It is easy to take a picture through the body in three minutes and through the hand in five seconds where a short time ago it would take one hour to take a picture through the body and five minutes to take a hand. This is a great improvement as it entirely eliminates the danger of electrolysis or so-called burning. The x-ray has absolutely no injurious effect on the body; all the injurious effects such as burning are caused by the current of electricity.

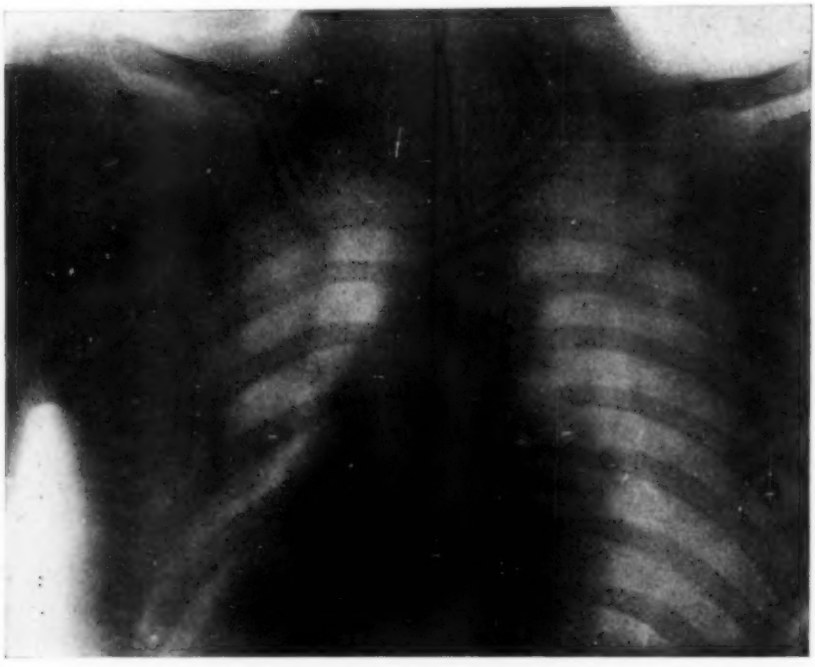

FIG. 3.

The current used to excite the Crookes tube being one of high voltage does not have to come in contact with the body to pass to it. If any part of the body is held within six inches or less of a Crookes tube some of the electrical current will pass to it which may not be felt by the person but if noticed will feel like a breeze blowing against the part unless the part is held within an inch or two when the current may jump in the form of a spark. Exposing a person close enough for the current to pass to him for five or ten minutes will do no damage, but if held six inches away for thirty minutes or more, or three inches for fifteen minutes or more, it is very liable to cause an electrolysis or so-called burning. To prevent burning, hold the part exposed eight inches or more away; if exposure is over five minutes there is absolutely no danger. In fifteen months' work with the x-ray taking pictures nearly every day I have never had a single bad result follow.

In making an exposure for a picture the further away you place the tube from the plate and the closer you place the object to be taken to the plate the better definition you will get. If the tube is held close to the part exposed or the part exposed is held away from the plate

the resulting radiograph will be magnified and distorted.

I use approximately the following distances of tube from plate and time of exposure on a person weighing one hundred and fifty pounds:

Hand and wrist, 30 seconds at 6 inches.
Forearm, 45 seconds, at 6 inches.
Arm above elbow, 1 minute, at 10 inches.
Shoulder, 4 minutes, at 18 inches.
Thorax, 3 1-2 minutes at 20 inches.
Hip joint, 5 minutes, at 22 inches.
Knee, 3 minutes, at 18 inches.
Foot, 2 minutes, at 14 inches.

FIG. 4.

By using the above distances I get good definition and still am not so far away but what I can make a short exposure. I have been using about the above distances in all my work and have never even produced a dermatitis or had any bad results, although when I first commenced the work I had to make long exposures, some as long as one-half hour and several of these in a day.

DEVELOPING X-RAY.

It is a great advantage to an x-ray operator to develop his own pictures; he will naturally give them more care than a photographer. Very often a picture which is over or under exposed can be developed carefully and a splendid picture obtained. A photographer can tell you your picture is under or over exposed, but it is impossible for him to express to you just how much or to what degree, while if you are accustomed to developing yourself you can tell exactly how much it is under or over exposed in proportion to the length of exposure you have given it then you are sure of getting a correct exposure on the second trial; if your tube gives off the same amount of rays and is placed at the same distances as with the first exposure.

In the choice of plates I always use a plate especially prepared for x-ray work which has a double thick emulsion on it. I have never seen any rules laid down for developing these plates, but I spoiled many a good picture by not continuing the development long enough.

I use either of the following developers: Pyro-Eikocum Hydro. or J. C. Tabloids, but use them much stronger than the formula given for ordinary plates and add two drachms of 10 per cent solution bromide of potash as a restrainer instead of about ten drops as for ordinary plates; I often use the following formula with the J. C. Tabloids: take three J and three C tabloids and dissolve in five ounces of water, then add two drachms, 10 per cent solution bromide potash. I also have some stock solution of the tabloids made up on hand to add if the picture is very slow in turning dark and some extra bromide if it turns dark immediately, showing over exposure. If the picture is through the arm or hand you can see first the outlines of the hand or arm will appear, then later the bones. If the picture is through the body or thick part this will not occur, but the part of the plates which will have the picture on it will turn dark slowly and you will not see the outline of the bones or only slightly.

In the above I refer to the upper or film side of the plates; the back of the plate will remain white much longer than the front. If the picture is through a thin part like the hand, the outline of the hand will not disappear entirely, but if through the body, the outline of it will soon be lost and the film side of the plate will look as though you had no picture. I continue developing, if for a hand, until the back of the plate has turned dark or nearly black with the exception of the part which has the outline of the hand, but this should be somewhat dark. If the picture is through the body I continue developing until all of the back of the plate has turned dark, then wash in water and put in the hypo. and leave for twenty minutes. On an average I take about twelve to fifteen minutes to develop the plates.

FIG. 5.

The image taken with the x-ray does not show in developing like in a photographing plate and the developing should be carried much further. As to the printing of the picture, I leave that to the photographer; if he does not get a good picture the first time he can try it again, but if he does not develop a negative well he can not do it over.

The x-ray certainly proves the often made assertion that you can not tell where a bullet is located by the direc-

tion from which it enters the body. In one radiograph I made, a ball was found buried in the body of the fourth dorsal vertebra; the party who did the shooting was considerably above him and shot downward, the ball entered in the side at about the seventh rib; this was twenty-three years ago. Twenty years ago he was operated on, as it caused paralysis of the lower extremities. An incision was made thirteen inches long on the side of the vertebrae but the bullet could not be found. About six months ago I located the ball by a radiograph, in the body of the fourth dorsal vertebra, after taking a radiograph extending from the fifth dorsal vertebra to the eleventh and another below this. He was operated on by Dr. Geo. Halley and the ball removed successfully; his paralysis has improved in his opinion some. Could the ball have been removed at the first operation the paralysis probably could have been relieved. The paralysis was all motor. He has always been well nourished.

In another case I located a twenty-two caliber ball in the pelvis on a level with the articulation of the head of the femur which entered on a level with and struck the fifth rib.

A blood clot will often obscure a foreign body. In a case brought to me for a radiograph of the hand to locate a needle, I did not remove the bandage. The Doctor assured me there were no pins in the bandage, and said he had made several incisions where the needle was supposed to be.

I then made an exposure and developed the negative but found no needle; but found light, irregular lines, where after examining the hand proved to conform to the incisions which were filled with clotted blood. I made another exposure and on developing the negative found the broken needle but no outlines where the clot showed before. The needle was under the clot in one of the incisions.

In another case I was trying to locate a piece of steel in an eye. I made the exposures with the plate on the side of the head and the tube opposite but in the negative I could not get the outline of the cavity of the orbit as is usual in taking a picture in this position. From a former experience with the needle, I concluded there must be a clot of blood in the eye which was proven correct as the eye was removed and found filled with clot. The piece of steel was in the clot.

FIG. 6.

Fig. 1 is a radiograph of a shoulder of Mr. K—— Residence, Guthrie, I. T., taken for Dr. F. R. Smiley, Boonville, Mo., showing a bullet lying on the scapula. The party who fired the pistol, a thirty-eight caliber, was standing directly in front, the ball struck the

clavicle and glanced to where it is shown in the radiograph.

Fig. 2. Fracture of base of neck of femur. Radiograph made for Dr. H. D. McQuade. Mr. L——, residence Kansas City, Mo. Age 38. Occupation, merchant. Fracture caused by fall. It is somewhat impacted but not sufficient that it could be diagnosed by measurements; there was considerable pain on movement of limb, he could move it himself but could not stand on it on account of pain, little swelling, one-half inch shortening; the exact condition is shown in the radiograph. It made the condition a certainty out of an uncertainty. The original radiograph shows the outline of the articulation of the head of the femur much more plain than the cut, proving there is no dislocation. It might not be out of place to mention here that any tubercular softening of the head of the femur can be accurately shown and also its relation to the head of the femur and its exact extent even if very small. I have two good pictures of tubercular softening, one in the head of the femur and one at the sacro-iliac articulation, both of special interest because they have been operated on and the correctness of the radiograph demonstrated. It is also interesting to note that in the reproduction of the radiograph of the fracture of the neck of the femur that although the bones at point of fracture are separated and the break does not extend entirely through the bone, still the lines of the fracture show very similar to what they would in a photograph of a bone with the flesh removed.

FIG. 7.

Fig. 3 shows the radiograph of a watch in the esophagus of a man just above the cardiac orifice of the stomach swallowed for the experiment of taking the radiograph of a watch in this position. Immediately after taking the radiograph it was removed by pulling it back through the mouth by the chain attached to it. The subject of this operation is an ostrich man who gives exhibitions of his different abnormal powers; among them are the swallowing of the watch and letting persons hear it tick by placing their ear to his chest; taking a piece of plate glass an inch square, one-half inch thick, crushing it in his teeth and swallowing it; he also swallows loaded cartridges, money, tacks, screws, seven grains of strychnine at a dose, twenty

grains morphine, three grains of arsenic and other poisons. He is able to take these large doses of poison by commencing years ago with ordinary doses and gradually increasing some until now it is a habit he can not quit. He says he passes the metallic articles in twenty-four hours.

Fig. 4. Radiograph taken for Dr. E. R. Lewis, showing deformity of bones of left foot, and also right one for comparison. On inspection both feet were apparently alike.

Fig. 5. Showing aneurism of arch of aorta. Case referred to me for a radiograph by Dr. C. F. Wainwright and Dr. Hal Foster. This case is especially interesting as the post mortem has been made. The radiograph was made about six weeks before death. The following history is given by Dr. Wainwright and Dr. Foster:—

"Mr. M. H. Stevens; age sixty-two; single; occupation, cigar dealer; born of healthy parents; temperate in habits; never had any severe sickness, commenced complaining about two years ago; slight cough which was paroxysmal and continued up to the time of death; he complained of slight aphonia and on examination of throat there was slight paresis of vocal cords and on physical examination of the chest the respiratory murmur on the left side was slightly enfeebled. Aside from this difference the examination of the lung was negative. There was a slight area of dullness above the heart and aside from this there was no physical signs of aneurism. The radial pulse in the two sides were similar. There was no inequality of pupil, no bruit or change in heart sounds, no abnormal pulsating area, nor pain. The heart was normal in size and there was no evidence of valvular lesion. The diagnosis of aneurism was made from the character of aphonia due to pressure upon the recurrent laryngeal nerve.

FIG. 8.

"The patient died from exhaustion after a history of two years duration and a very large fusiform aneurism was found involving the entire arch of the aorta extending to the body of the vertebrae

against which it pressed, filling up almost entirely the upper part of mediastinum. The tumor was filled with coagulated fibrin through which an opening passed about the size of the aorta, abnormally. The x-ray in this case proved to be valuable from the fact that there was no physical signs of aneurism aside from the pressure upon the recurrent nerve. The dark area as shown in

FIG. 9.

the picture was highly diagnostic and strengthened the opinion of the aneurism."

Fig. 6. Needle in hand. Mrs. K—— broke off a needle in the palm of her hand. Dr. Scott made an x-ray photograph of the hand which showed the fragment to be at the junction of the phalanx and metacarpal bone of the third finger. The needle was apparently pushed through the head of the phalanx, but when we operated could not find the needle where we supposed it was. Another x-ray showed the needle free in the tissues between the third and fourth fingers at the metacarpal articulation; the second operation proved successful; after an incision over the needle and down to it the knife struck the fragment. The knife serving as a guide, a forcep introduced along the blade easily grasped the needle which was withdrawn. Any one who has attempted to remove a needle from the fleshy parts of the body must certainly know the difficulties of such a procedure. An x-ray photograph acting as a guide makes this operation a comparatively simple affair.

Altogether the x-ray has proved itself an invaluable aid to us in locating foreign bodies we would no more think of operating without its aid than operat-

ing without the usual aseptic precautions.—Drs. Rosenwald, Adams and Anderson.

Fig. 7. Radiograph of the arm taken for Dr. G. O. Coffin, showing dislocation of radius and shattering of the ulna by a thirty-eight caliber ball.

Fig. 8. Radiograph of pelvis of girl six years old taken for Dr. Perkins, showing dislocation of femur with partial absorption of head of bone. Pelvis tilted some.

Fig. 9. Radiograph of head, taken for Dr. J. Block, showing a round bullet in back of same; another radiograph was taken of the above head from before, backward, showing the ball to be one-half inch to the right of the median line. The party was shot about thirty years ago. The ball entered in back of external canthus on the left side. A short time ago he had a paralysis of right arm; as the ball entered near the arm center of the brain, it was thought it might be the cause of the paralysis. Dr. Block therefore had a radiograph taken to locate the ball, and it being found in the back of the head, was known that the ball itself was not causing the paralysis.

Fig. 10. Radiograph of arm taken for Dr. G. W. Lilly, showing non-union of the ulna and union of the radius. The bones had been wired together, the wire is also shown.

FIG. 10.

Fig. 11. Radiograph of head taken for Dr. E. W. Hethrington and Dr. W. E. May, showing bullet in head, behind the eye. A picture of this case was taken also from before backward and showed the ball on a line a little to the nasal side of the pupil of the right eye.

Fig. 12. Radiograph of abdomen of

ostrich man, Mr. G. W. Whallen, taken for Dr. E. Von Quast. The dark mass on the left side of the picture contained one hundred and sixteen different pieces of metal and a handfull of glass. Patient operated on June 8, 1897, at Ger-

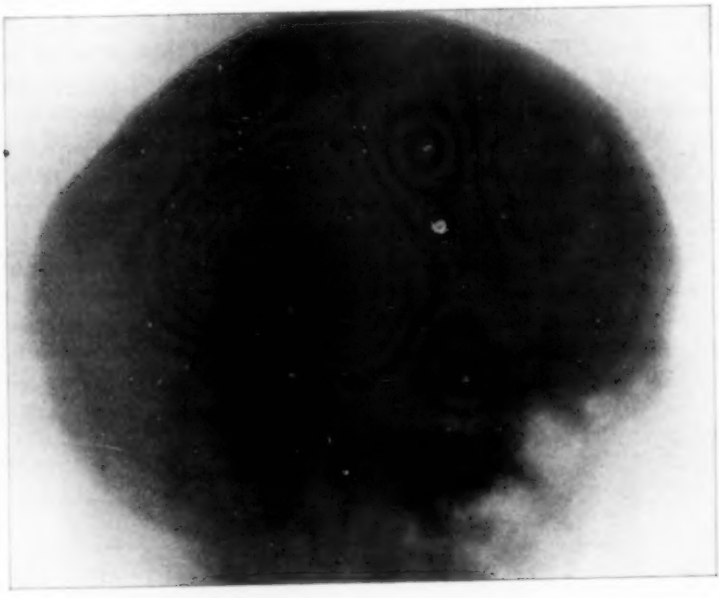

FIG. 11.

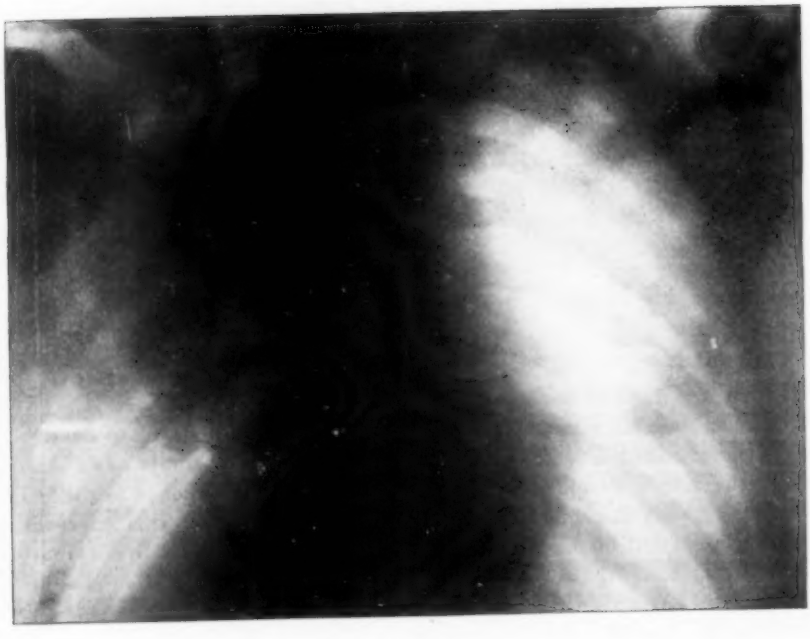

FIG. 12.

man Hospital. Occupation, showman; twenty-six years old. Median Gastrotomy. The following foreign bodies removed:—3 oz. glass, two pocket knives, one a barlow four and one-half inches long, the other one, a four blade, five knife blades, one barb wire staple, three screws, one horse-shoe nail, sixteen tacks, forty-one wire nails, forty-seven twelve penny nails. On account of the weight of the above articles, the stomach was lower than normal. The outline of the articles do not show, as they were all rolled up in a round mass. Patient emaciated from want of food, he could not eat anything for about one week before operation. Foreign bodies had been in stomach for two or three weeks. After operation stomach was closed by interrupted and lambert sutures. Death in forty-eight hours from enteritis and exhaustion. There had been hemorrhage from bowels. The post mortem showed absolute union of wound in stomach, no leakage, wound had healed in part.

The above radiograph and history of cases are reproduced by permission of the physicians for whom they were taken.

New Ridge Building.

ANODE RAYS. Sandrucci. *Nuovo Cimento*, March; abstracted in the Lond. *Elec.*, June 17.—He showed that both electrodes in a vacuum tube emit so-called cathode rays, the only difference being that they are of greater strength at the true cathode; at a certain exhaustion there proceed from both cathodes two cones of rays, one enclosed in the other or partly separated, which bear charges of opposite signs; both are deflected by a magnet; there is no radical difference between the two kinds of rays.

X-RAYS. Kalischer. *Elek. Zeit.*, June 16.—The beginning of a review of the subject of x-rays, with special reference to that which may be of permanent value.

CATHODE RAYS IN AN OSCILLATING ELECTRIC FIELD.

The theory of the cathode rays most in favor among physicists in this country is that which assumes that the rays consist of a stream of particles charged with electricity. This theory has not been generally accepted in Germany, though recently it has made a few converts.

One apparently fatal objection urged against the view that the cathode rays consist of charged particles, is that they are not deflected by an electrostatic force. If these rays consist of electrified particles, one would expect *prima facie* that they would be more susceptible to an electrostatic force than to a magnetic force. The reverse, however, is the case. They can be readily deflected by a comparatively weak magnet; but Hertz found that no deflection was produced when the rays passed between two plates connected to a battery.

Prof. J. J. Thomson makes an ingenious attempt to explain away this anomaly in the charged particle theory. He says: "We must remember, however, that the cathode rays, when they pass through a gas, make it a conductor, so that the gas, acting like a conductor, screens off the electric force from the charged particle, and when the plates are immersed in the gas, and a definite potential difference established between the plates, the conductivity of the gas close to the cathode rays is probably enormously greater than the average conductivity of the gas between the plates and the potential gradient on the cathode rays is probably very small compared with the average potential gradient." He also describes an experiment in which a deflection can be produced when the electrostatic field is caused to act on the dark space next the cathode, and this he explains by the hypothesis that the gas in the dark space is either not a conductor at all, or, if a conductor, a

poor one, compared with the gas in the main body of the tube.

An interesting experiment is described by J. J. Thomson, which illustrates this curious resistance of the dark space to the passage of the cathode rays. Two spherical bulbs were connected together by a glass tube; one of these bulbs was small, the other large; they each contained a cathode, and the pressure of the gas was such that the dark space round the cathode in the small bulb completely filled the bulb, while that round the one in the larger bulb did not extend to the walls of the bulb. The two bulbs were wound with a wire which connected the outsides of two Leyden jars; the insides of these jars were connected with the terminals of a Wimshurst machine. When sparks passed between these terminals, currents passed through the wires and induced currents in the bulbs, which caused a ring discharge to pass through them. Things were so arranged that the ring was faint in the larger bulb and bright in the smaller one. On making, however, the wires in these bulbs cathodes, the discharge in the small bulb, which was filled by the dark space, was completely stopped, while that in the larger one became brighter. Prof. Ebert has also shown that a cathode stream is deflected out of its straight path by creating a dark space in its way.

The charged particle theory gives no satisfactory explanation of this curious property of the dark space; and though some ingenious experiments, similar to that of Perrin, have been devised by J. J. Thomson to show that the cathode rays discharge negative electricity on anticathode conductors, yet, while so many important phenomena remain inexplicable by the theory, it appears advisable, for the present, to suspend our judgment.

Jauman also obtained a deflection of the cathode rays by placing a conductor close to the side of the tube just in front of the cathode. But this has been shown by Schmidt and Wiedemann † to be due to a displacement of the starting point of the cathode rays owing to the change produced in the electric field by the presence of the charged conductor, and not to a deflecting influence exerted on the cathode rays by the electrostatic field. The deflection obtained by J. J. Thomson may be explicable in the same way, since the conditions of his experiment were very similar to those of Jauman.

Though it is still doubtful whether the stationary electric field produces any deflection of the cathode stream, it has been recently shown by Schmidt ‡ that unmistakable deflections are produced by an oscillating electric field. The conditions of the experiments made by Schmidt exclude the possibility of the deflections being due to a displacement

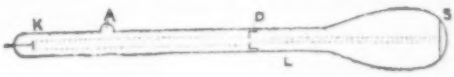

FIG. 1.

of the starting place of the cathode rays.

Schmidt's experiments were made with a special vacuum tube designed by Braun.§ In this tube, illustrated in fig. 1, K is the cathode disc, and A is the anode. At D is an aluminum diaphragm with a central aperture about 2 mm. in diameter; S is a disc of mica coated with phosphorescent material, on which the phosphorescent spot can be seen through the glass when looking at the end of the tube.

If an insulated metal plate is brought near the tube in the neighborhood of L, the phosphorescent spot widens out a little. This phenomenon is intensified if the plate or, in its place, a brass ball

* Royal Institution Lecture, April 30, 1897, p. 10.

† E. Wiedemann & G. C. Schmidt, Wied. Ann., 60, p. 510, 1897.

‡ K. E. F. Schmidt, Abhandl der Naturforsch-Gesellschaft zu Halle, 21, p. 163 and 173, 1897.

§ Wied. Ann., Vol. 60, p. 552.

is connected to the cathode pole of the induction coil. Under these circumstances a comet-like tail is thrown out from the side of the spot opposite to the inducting body. The appearance of some of these comet tails is shown in fig. 2.

Since the publication of Schmidt's experiments, this subject has been taken up and thoroughly investigated by Prof. Ebert, of Kiel * Instead of the induction coil, Ebert used a small alternating dynamo driven at the highest possible speed by an electro-motor. This machine generated an alternating current with a frequency of 60,000 per minute. The E. M. F. of this current was raised

FIG. 2

by a Siemens spark inductor with the condenser removed to 1,500 volts. The terminals of the secondary of this coil were connected to a pair of condenser plates placed at opposite sides of the Braun tube close behind the diaphragm. The cathode rays in the tube were produced by an influence machine. Ebert's arrangement, therefore, differs from Schmidt's in several features. (1) With Ebert's apparatus the oscillating electric field is persistent and regular, while in the Schmidt arrangement it is irregular and quickly damped, owing to the oscillations being derived from the ordinary induction coil. (2) The source of the oscillating field is independent of the source of the cathode rays in Ebert's arrangement, while in Schmidt's they are both derived from the same source, viz., the secondary of an induction coil.

Ebert satisfied himself, by experiment, that the time changes of the electric field between the condenser plates were almost perfectly sinusoidal, and followed one another without a break. With this apparatus were obtained not only comet-tailed extensions of the nucleus spot on the phosphorescent screen, but well defined deflected rays could be seen, which, in the rotating mirror, were drawn out into oscillation curves of the greatest regularity.

The two metal plates, P_1 P_2 fig. 3, having each a surface of 3·7 x 6·8 cm., were formed into a small condenser by fixing them at one end to a block of vulcanite, S_2 2·5 cm. thick. These plates projected far enough over the vulcanite to embrace the tube, B. When the machine was started, the spot on the phosphorescent screen was drawn out into a thick vertical band of about 3 cm. in length. This experiment, therefore, proves that in the oscillating electric field cathode rays are distinctly deflected, and always in the direction of the lines of force, the latter assertion being easily demonstrated by turning round the condenser. The deflection in this case can not be explained on the theory of the displacement of the starting point of the cathode rays, since that was 30 cm. distant from the condenser plates, and it was found that these plates lost their deflecting power if they were moved away from the tube even a few centimeters. The deflection is greater the greater the surface of the plates, and it also increases if the condenser is moved toward the end of the tube, as if the amplitude depended on the leverage at which the condenser acted. The deflection also increases with the potential difference between the plates.

Ebert suggests three different theories to explain this deflection effect of the os-

* Wied. Ann. 64, p. 240. 1898.

cillating electric field, and then proceeds to examine these theories by crucial experiments to determine which gives the correct explanation. He considers it possible that the deflection may be due to:—

I.—The magnetic effect of the displacement currents in the dielectric.

II.—The electrostatic charges on the walls of the vacuum tube.

III.—The deflection effects of secondary cathode phenomena.

I.—THE INFLUENCE OF THE DISPLACEMENT CURRENTS.

The displacement currents of Maxwell's theory oscillate backwards and forwards along the electrostatic tubes of force, and would consequently give rise to circular magnetic lines of force surrounding each tube. These magnetic circles are equivalent, according to Stokes' theorem, to a shell of rectangular magnetic lines of force lying in the planes joining the edges as the condenser plates. The magnetic effect of these lines would tend to deflect the cathode rays in exactly the same direction as is shown by Schmidt and Ebert's experiments. But it remains to be seen whether in other respects this magnetic force is sufficient to account for the phenomena observed.

Ebert makes use of several arguments to show that, notwithstanding this partial agreement between the predicted and the observed results, the deflections are *not* due to the influence of the displacement currents. One of the strongest is the answer to the following question: Is the movement of the cathode rays in phase with the charging of the condenser, or with the displacement current? If G is the electrostatic potential gradient, the displacement current is determined by dG/dt, and therefore differs in phase from the charging of the condenser by a quarter period. If the deflection is due to the magnetic effect of the displacement current, it should have a phase displacement of about 90 deg. relatively to the curve of tension. In order to determine this point, the primary current of the transformer was made use of for comparison. By causing the two forces, whose phases are to be compared to act on the cathode beam at right angles, the shape of the resulting curve will give the required information, in accordance with the well known rules for combining simple harmonic motions. In the primary circuit of the transformer was interpolated a small solenoid, M, fig. 3. This solenoid or bobbin was mounted on guides, R_1, at right angles to the axis of the Braun tube, B. The condenser, consisting of the two metal plates, P_1 P_2 and an intervening

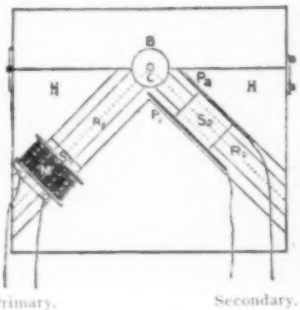

FIG 3

vulcanite block, S_2, was mounted on guides, R_2, at right angles to the axis of the tubes and also to the guides, R_1. The bobbin, M, produces a magnetic deflection of the cathode rays at right angles to the magnetic lines of force, and the condenser, P_1 P_2, produces a deflection in the direction of the electrostatic lines of force. These two deflecting forces, therefore, produce deflections at right angles to each other, and the bobbin and the condenser can be adjusted at such distances from the tube that the deflections are equal.

As the result of numerous experiments, Ebert found that the figures produced by the combination of these two perpendicular oscillations were invariably approximately circular ellipses. This

showed that the phases of the oscillations differed by as nearly as possible a quarter period. Now we know that the phase difference between the primary and secondary of the transformer must in this case be quarter period, and it follows, therefore, that the oscillations of the cathode rays are in phase with the charging of the condenser and not with the magnetic field produced by the displacement currents.

Ebert has also shown, by calculation, that the deflection which would be produced by the magnetic field produced by the displacement currents would be only 1-300000th of that actually observed.

It may be taken, therefore, as proved, that the oscillations of the cathode rays between the plates of a rapidly charged and discharged condenser are *not* due to the magnetic effect of the displacement currents.

II.—The Electrostatic Charges on the Walls of the Vacuum Tube.

It is well known that a vacuum tube in which cathode rays are being produced shows strong electric charges on its walls. In the Braun tube, which is somewhat different in shape from the ordinary Crookes tube, the distribution of the surface charges can be easily ascertained by a proof ball and an electroscope. The proof ball (of brass) is fixed on the end of a glass rod; different parts of the surface of the active tube are touched by the ball, and the charge on the ball is then tested by the electroscope. By exploring the surface of the Braun tube in this way, Ebert found a very strong negative charge on the cathode end of the tube, which covered the whole surface of the tube to about half way between K and A (fig. 1). The charge was so strong that sparks could be drawn from the surface of the tube, and the surface charge lasted for a considerable time after the discharge in the tube had stopped. The negative charge was gradually neutralized towards A, and before A was reached was replaced by a positive surface charge, which, however, was not quite so strong. This positive charge continued in varying amount up to the diaphragm, D, reaching a minimum shortly before D was reached. In the cylindrical part of the tube behind the diaphragm, D, there was found very strong positive charge, which increased steadily towards the end, S, and reached such an intensity on the surface of the pear-shaped end, that small sparks could be drawn off after the discharge in the tube had ceased. The positive charge outside the tube implies a corresponding negative charge on the inner surface of the tube. In the active Braun tube, therefore, all parts of the inner surface of the section D S, even where the cathode rays do not strike, are coated with a layer of positive electricity which binds a corresponding negative charge outside

By these surface charges the course of the cathode rays is essentially influenced. It is well known that the cathode stream always moves along the axis of the tube, even with considerable variations in the shape of the cathode; but if the surface distribution on the tube is disturbed by putting one part to earth, or by drawing off sparks, the beam of cathode rays jumps at first suddenly to one side, and then returns slowly to its original position. The return of the rays to the axis of the tube is evidently due to the restoration of the surface charges by the action of the tube.

The oscillating electric field will evidently have the effect of periodically changing this surface distribution, with the result of producing oscillations of the cathode stream, in the same way in which a single disturbance produces a temporary deflection. Some idea of the mechanism by which this deflection is produced may be obtained from what follows.

III.—The Influence of the Cathode Phenomena Called Into Existence by the Oscillating Electric Field.

Ebert and Wiedemann have shown* that when alternating electric tensions are applied to electrodes on the outer surface of a sufficiently evacuated tube, cathode rays, with all their attributes of dark space, &c., are produced opposite the electrodes inside the tube. It was found sometimes, however, that these phenomena could not be obtained, though all the essential conditions of the experiment appeared to have been fulfilled. Then it was discovered that the cathode phenomena could always be started again by sending a direct discharge through the tube from internal electrodes. From this it would appear that the cathode discharges produced by alternating potentials applied to external electrodes are only possible when there are considerable surface charges on the walls of the vacuum tube.

From what has been said above, it will be seen that these conditions exist in the Braun tube, as used in Schmidt's and Ebert's experiments. When the tube was examined in a dark room, sparks could be seen passing between the condenser plates and the sides of the tube, but no corresponding cathode discharges were observed inside the tube till after the main cathode discharge had taken place.

Ebert and Wiedemann have shown† that the dark space from one cathode offers a great resistance to the passage of rays from another cathode. They described one experiment, in which, by means of a movable cathode, the rays were brought gradually closer to the dark space of another cathode. As they were brought closer they failed completely to penetrate through, but became deflected and bent round the outline of the dark space.

These experimental results can now be applied to explain the oscillation of the cathode rays in the oscillating electric field. The electric oscillations proceeding from the condenser plates, will project a dark space into the interior of the tube, first from one side and then from the other. These alternately projected dark spaces bring about the observed oscillations in the main cathode beam. According to the experiments of Kaufmannand Aschkinass, ‡ the deflection *ceteris paribus* is proportional to the potential gradient of the deflecting cathode. There must, therefore, with a regular periodic electric force, be an oscillation of the cathode rays obeying the sine law. And this is exactly what has been observed.

These interesting experiments of Ebert's appear to show that the deflection of the cathode rays in the oscillating field are not primarily due to the potential gradient of the electrostatic field but to a cathode discharge which is created by this gradient. Why the dark space should have this curious resistance to the passage of cathode rays remains unexplained, though it appears to be a well established experimental fact. Ebert, indeed, with true scientific caution does not consider that his experiments exclude the possibility of direct electrostatic influence, but only that such influence if it exists is too weak to be shown by the Braun's tube. These experiments, however, appear to be fatal to the view that the whole of the electric current is carried by the particles of the gas in the form of electric charges. They point rather to the view that the current inside a Crookes tube differs only in degree from what takes place when a current passes through a gas outside the tube.

Ebert points out that his apparatus,

* Wied. Ann. 50, p. 42, 1893.

† Sitzungsber Physikal Societat Erlangen,' 24, p. 114, 1891.

‡ Wied. Ann. 62, p. 588, 1897

illustrated in fig. 3, forms a very convenient and sensitive arrangement for measuring the difference of phase between the primary and secondary currents in transformers, and recommends its use to electrical engineers.—*Electrical Review*, London, June 3, 1898.

X-RAYS IN THE ARMY.

The question has been asked, how can the x-rays be used to advantage on the battlefield? Wherever the surgeon can pitch his tent, there also a tent suitable for a complete x-ray apparatus can be pitched, being constructed the same as any other tent, only lined with black cotton flannel, and it is ready for the Rhumkorf coil, storage battery, Crookes' tubes fluoroscope and the necessary adjunct, the Dennis fluorometer.

By the fluorometric measurements and markings, the location of a bullet or piece of shell can be accurately located in a few minutes and the patient turned over to the surgeon; with an exact diagram marked with an indelible pencil on the limb or body, showing to the surgeon at what point he can find the missile.

Sometimes a few hours delay in the treatment of wounds makes it necessary to save life, that the soldier suffer the amputation of a limb. The use of the fluorometer does away with the delay consequent upon taking a radiograph and the necessity of taking a photographic outfit onto the battlefield.

It should be considered a greater achievement for the surgeon in the army to save a soldier's limb by extracting a bullet or piece of shell than to successfully amputate it, when gangrene or blood-poison has developed from delay in removing the foreign body, consequent upon his being carried in an ambulance to an army hospital located miles away from the scene of battle. To save an arm or leg may mean the saving of hundreds or even thousands of dollars in pensions in after years.

RECENT ADVANCES IN THE TREATMENT OF FRACTURES OF THE EXTREMITIES.*

BY JOHN B. ROBERTS, M. D., OF PHILADELPHIA.

Surgeons have recently made notable advance in the investigation of fractures by the employment of Roentgen rays, which, by means of the fluoroscope or photographic plates, show the exact condition in obscure cases of fracture. In other instances fractures which were supposed to have been properly reduced have been shown by the use of the Roentgen rays to be still the seat of deformity.

Another improvement is the freedom with which obscure fractures may be investigated by aseptic incision of the soft parts, which discloses the exact nature of the bony lesion.

The treatment of fractures has been much improved in recent years by the more extensive adoption of plastic splints made of gauze and plaster-of-Paris. These should substitute, to a great extent, the manufactured splints of metal and wood which instrument makers sell at a high price for use upon fractured limbs which they seldom fit. It is possible to properly pad a wooden splint or successfully adjust a metal or felt one to the injured limb. It is, however, far better to make a splint out of plastic material, like gauze filled with gypsum, which will absolutely correspond with all the inequalities of the surface of the patient's limb.

Ambulant splints, which permit patients with fractures of the leg to get out of bed and walk upon the injured member at a comparatively early period, are also the result of the advance in fracture treatment that has come by study of the imperfections of older methods. The employment of massage during the entire period treatment of a fracture will be

*Abstract of an address before the Altoona Academy of Medicine and Surgery. "Pennsylvania Medical Journal," May, 1898.

found to lessen the rigidity of the muscles, stiffness of joints, and inflammatory infiltration around the seat of fracture, which so often retard the patient's full recovery of function. Massage should be used with discretion, but may be employed with much satisfaction to the patient every time the splint is removed for the inspection of the seat of fracture. The desirability of this method of establishing a healthy condition of the soft parts makes it desirable to remove the splints much more often than used to be thought necessary.

Tenotomy of the tendon of Achilles, to prevent displacement due to muscular spasm, in fractures of the leg near the ankle is another accessory of treatment often neglected. Tenotomy will also probably be found of avail in some cases of fracture of the olecranon, and perhaps in other regions where muscular contraction leads to difficulty in maintaining reduction of fragments.

The surgeon should not forget that where accurate coaptation of the broken bone can not be readily accomplished, an aseptic incision will add practically nothing to the patient's risk. Such an incision not only gives a better understanding of the condition of the parts, which may be essential to proper treatment, but permits disentanglement of fragments of bone from lacerated muscles, thereby averting non-union of the fracture. It also permits the use of wire or cat-gut sutures in cases demanding such direct methods for maintaining apposition.

It is probable that few surgeons, and perhaps almost no general practitioners, realize how easy it is to keep a fractured bone in position when the surgeon sees the exact line of break. Much of the deformity of many fractures would be overcome and the anxieties of the period of treatment lessened if the medical attendant, after finding the line of fracture, simply drove a nail through the soft tissues into the broken bone in such a manner as to hold the pieces together. It is not improbable that the time is near at hand when many fractures will be treated by some such direct method. Ordinary wire nails or long tacks made aseptic can be driven through aseptic tissues into the bone without disadvantage. This can be done in closed fractures as well as in the open ones. An ordinary straight surgical needle does very well for this purpose. If necessary, an ordinary brad awl may be used to drill a bone.

Refracture or osteotomy of deformed union after fracture should be used much more frequently than it is. It is probable that much of the difficulty in fractures about joints comes from imperfectly apposed fragments. Investigation of such cases by free incision and the use of nails or sutures in the bone to hold the fragments in proper position would probably lead to more perfect restoration of function than is usual in fractures involving the joints. Many surgeons who fearlessly investigate fractures associated with wounds experience unreasonable hesitation in making aseptic incisions down to the seat of fracture in obscure and troublesome cases.

The recent advances here outlined in the treatment of fractures of the extremities have brought about the following results: The restoration of the patient to a condition of health permitting him to transact business in much less time than formerly; the establishment of this desirable end with little or no pain during the period of treatment; and the much less frequent occurrence of troublesome anchylosis after fractures involving joints.

V SIBILITY OF ROENTGEN RAYS. Dorn. *Wied. Ann.*, 64, p. 650; abstracted in *L'Eclairage Elec.*, June 4.—A reply to the criticism of his recent publications on this subject.

ROENTGEN SOCIETY, LONDON.

Committee of Inquiry into the Alleged Injurious Effects of X-rays.

It having been alleged that injurious effects on the human body have been caused by exposure to x-rays, it was decided at a meeting of the Council of the Roentgen Society on April 5th to nominate a Committee to collect information on the subject.

The following members were selected, with power to add to their number :—

Professor Sylvanus P. Thompson, President, Dr. David Walsh, Secretary, ex-officio members; Mr. Thomas Moore, Dr. Barry Blacker, Mr. Ernest Payne, Secretary to the Committee, Hatchlands, Cuckfield, Sussex.

This Committee will be glad to receive information from all workers with x-rays of any case of injury that may have come under their notice after exposure of a patient to the rays.

In order to obtain accurate information the Committee have prepared a set of questions to which they would be glad to receive answers as complete as possible. The questions are framed with a view to elicit opinion and collect information which will show whether the injury was the result of any of the following causes :—

1. The x-rays themselves directly.
2. Some electrolytic or electrothermal action of a leakage discharge current from the leads or from the terminals of the tube.
3. Some action due to the varying electrostatic charges on the surface of the tubes.
4. Some combination of these causes.
5. Some other, hitherto unrecognized, kind of radiation emitted simultaneously with the x-rays.
6. Some other cause hitherto unobserved.

A list of the questions is given below. The Secretary of the Committee will be glad to send forms for answer to any medical man or other worker who may have information of any case about which he is willing to give particulars.

No names will be published, connected with the information supplied, except by the distinct consent or request of those concerned.

The Committee will also be glad to receive accounts and results of any experiments that may have been tried which throw light upon the subject. They hope to be able to collect sufficient details of the cases that have occurred (which are happily not numerous) to enable them to place the results before general meeting of the Society before the end of the year.

QUESTIONS.

MEDICAL.

1. Nature of injurious effect.
2. Description of case radiographed.
3. Part exposed to the rays.
4. Condition of subject.
   - *a.* Well nourished or emaciated.
   - *b.* Temperament—nervous or phlegmatic.
   - *c.* Diathesis of patient.
   - *d.* Local condition of part exposed.
5. Did the patient complain of any feeling of warmth, tingling, or other sensation during or after the exposure ?
6. Duration of effects, temporary or permanent. Remarks.

ELECTRICAL.

7. Apparatus employed—Induction coil, spark-length, voltage and amperage used in exciting the same, or influence machine.
8. Exact form of tube, length from terminal to terminal.
9. Distance of tube from patient's body.
10. Number of exposures. Interval, if any, between the exposures. Duration of each exposure.
11. Situation of tube with regard to body or limb of patient; *i. e.*, position of anode and cathode.
12. What covering, if any, was used.
    - *a.* Material of which it was composed.
    - *b.* Rough or smooth, thick or thin.
    - *c.* Color, if dyed.

    Remarks.

David Walsh, M. D., is Hon. Sec'y of the Roentgen Society and J. W. Barbour, M. D., is Librarian.

The mathematical accuracy of the Dennis Fluorometer in correcting divergence of the x-rays was recently demonstrated in the St. Louis Hospital.

THE ROENTGEN SOCIETY, LONDON.

A meeting of the Roentgen Society was held at 11, Chandos Street, on Tuesday, March 1st, 1898. The President, Prof. Silvanus Thompson, F.R.S., in the chair. Minutes of previous meeting were read and confirmed.

The following were balloted for and declared duly elected: Prosper H. Marsden, M. D.; W. J. Paley Marling, M.A.; W. A. Coldwell; J. Morrison Barbour, M.D., F.R.C.S.; G. Paxton.

The following candidates were nominated, on the recommendation of the Council, to be balloted for at the next meeting: H. W. Cox, H. J. Loe, John H. Dudgeon, Miss Roma Austen, Miss Moberley, A. P. Sinnett, Dr. Heber Robarts.

Mr. Isenthal introduced M. Rochefort, of Paris, who demonstrated a new coil invented by him jointly with M. Wydts.

The Secretary showed a skiagram of double congenital dislocation of the hip by Mr. Noble Smith.

The President mentioned a case of writing submitted to him for Roentgen ray examination, and the matter was discussed.

Mr. Ernest Payne suggested that in view of the importance of the so-called Roentgen ray dermatitis, a committee of investigation be appointed by the Society.

After some discussion, the further consideration of the matter was left to the Council.

The date of the next meeting was announced to be April 5th.

A paper was read by J. H. Gardiner, F.C.S., on "The Relation between the Photographic Activity and Penetration of Roentgen Rays generated at different vacua."

A general meeting of the Roentgen Society was held at 11, Chandos Street, on Tuesday, April 5th, 1898, at 8 p. m. Prof. Silvanus P. Thompson, F.R.S., in the chair.

The President announced with great regret that the Hon. Secretary, Dr. Walsh, was absent through ill health, and that Mr. J. J. Vezey, a member of Council, had kindly undertaken his duties for the evening.

The minutes of last general meeting were read and confirmed.

The following were balloted for and declared duly elected: H. W. Cox, H. J. Loe, J. H. Dudgeon, Miss Roma Austen, Miss Moberley, A. P. Sinnett, Dr. Heber Robarts.

The following candidates were nominated on the recommendation of the Council, for ballot at next meeting: Leon Gaster; Arthur Talbot; Walter D. Jamieson; John Lynn Thomas; T. Maltby Clague; W. Reginald Cookson; Frank S. Pepperdene, M.A., Ph. D.; Margaret Mary Sharpe, L.R.C.P., L.R.C.S. Edin.; Leslie Miller, A.I.E.E.; Harold H. Simmons, A.I.E.E.; Ernest Greville, M.B., C.M. Edin; F. H. Buhl; Sydney F. Walker; Lewis Jones, M. D.; Alfred Apps, M.I.E.E.

Exhibits:

1. A drawing by Mr. Webster, and a note supplementary to his paper read in January last.

2. Two photographs from Mr. W. A. Coldwell, one a case of hip disease, the other a case of prostatic calculi.

The President announced that, in accordance with the suggestion made at the last general meeting by Mr. E. Payne, the Council had just appointed a committee for the investigation of dermatitis (x-ray).

The next meeting was announced for May 10th.

A paper was then read by Mr. James Wimshurst on "The Advantages of the Influence Machine for Lighting X-ray Tubes," with a demonstration.

RE-ENFORCED RADIOGRAPHS. Lond. *Rev. Gen. des Sc.* June 15.—A short article in which he describes experiments made with the use of fluorescent screens behind the photographic plate, for the purpose of re-enforcing the radiograph or producing a darker impression in a shorter time; others who tried it came to the conclusion that such images were not as clear and that it was due to the granular nature of the re-enforcing plate. He made a systematic study of this, using strips of five different re-enforcing screens on the back of the same impression and also a band in which the image was not re-enforced; the resulting print is reproduced. It shows that the actions of the various screens are quite different; the greatest re-enforcing was obtained with the sulphide screens of Becquerel, and especially with those of Kahlbaum, both of which fluoresce with a violet tint; with a phosphorescent screen, or those made of the platinum salts, the impression was less pronounced than when no screen was used. The sharpest definition was where there was no screen, the others showing a sort of halo around the edges, but this he found was not due to the granular nature of the material, but to a true halo caused by the diffusion of the light, and which, therefore, increases with the time of exposure, and is due to the fluorescent radiations.

"THE use of the x-ray will prove of the greatest value in all future attempts to locate bullets. In order to locate the bullet with sufficient accuracy to enable the surgeon to determine the propriety of an operation for its removal, and to guide him safely in his work, photographs from at least two directions will have to be taken. Every field and general hospital should be supplied with an x-ray apparatus, and in all difficult cases this, one of the most recent diagnostic inventions, should be made use of before undertaking an operation, and in preference to repeated recourse to the probe."—Extract from an article by Nicolis Senn, M. D., entitled, "The Modern Treatment of Gunshot Wounds in Military Practice," which appears in *The Journal of the American Medical Association*, for July 9. Dr. Senn is Lieutenant-Colonel U. S. Volunteers, Chief Operating Surgeon with the army in the field.

AT the transactions of the New York Surgical Society recently, Dr. L. A. Stimson exhibited a large number of radiographs, showing fractures of the elbow, forearm, wrist, and ankle, taken at the Hudson Street Hospital. Those of the elbow, taken in connection with photographs and specimens presented, show that the "gunstock" deformity is caused by angular displacement inward of the lower fragment after supracondylar fracture, the displacement being probably due to pressure of the sling under the elbow.

The radiographs of Colles' fracture showed comminution of the lower fragment to be frequent at all ages, and the prominence of the ulna to be due to the ascent of the lower fragment of the radius and the carpus; also that dorsal displacement of the lower fragment of the radius is much less marked than the common "silver fork" deformity indicates; also that fracture by extreme dorsal flexion of the wrist must be very rare. Fracture of the styloid process of the ulna was found only in cases with marked displacement.

The radiographs of fracture at the ankle showed very plainly the differences between fractures by inversion and those by eversion or abduction of the foot, the latter giving the well-known lines of fracture of Pott's fracture, while in the former the external malleolus is broken low down and the internal malleolus so high up that it brings away a considerable adjoining piece of the tabia.

A PHOTOMETER FOR SKIAGRAPHY. DR. BICSALSKI. *Deutsche med. Wochensch.*, 1898.—The author describes the following apparatus: A black pasteboard box, narrowed down at one end and cut to fit the face of the observer, the other end having a round hole, which is placed against the x-ray tube. In the box, and nearer the observer's end, is the usual fluoscopic screen, 12x12 c.m. In front of this (nearer the opening for the x-ray tube) is a pasteboard screen divided into thirty-six squares. One of these squares is covered with one layer of tin foil, the next with two layers, and each following square has an additional layer. Each square also has on it a wire figure, denoting the number of layers of tin foil.

Looking through this apparatus at the glowing tube, the figure on that square which can still just be made out denotes the number of layers of tin foil the particular x-ray can penetrate, and consequently the intensity. The knowledge of such intensity is of much value in estimating the desired exposure for a dry plate.—*The Post Graduate*, N. Y.

SOME interesting particulars are at hand from Vienna of a new application of the Roentgen rays for curative purposes. These were communicated by Dr. Edward Schiff, lecturer at the Vienna University at the last sitting of the Imperial and Royal Medical Society. A series of experiments conducted by Dr. Schiff and his assistant proved that these rays could be used for the cure of disease in a manner capable of perfect control by means of a more or less intense application for a longer or shorter period, producing reaction in the exact degree required. In this way it has been possible for the lecturer, on the one hand, to remove hair from parts of the body where it constituted a disfigurement without causing the slightest inflammation, while, on the other hand, he has been able to treat lupus with uniform success by means of an artificial inflammation, the intensity of which he was in a position to increase or reduce at will. The results secured by the new method both in the removal of superfluous hair and the treatment of lupus were demonstrated in the persons of some of Dr. Schiff's patients.—*Health.*

PATIENT WITH A BROKEN NECK LIVES A YEAR.—John K., a lad 9 years of age, living in Camden, N. J., fell from a tree June 9, 1897, sustaining a fracture of the cervical vertebra. The x-ray was applied and confirmed the diagnosis, locating the spicula of bone pressing against the spinal cord. Laminectomy was performed and the fragments of bone removed. The boy subsequently regained consciousness and by means of appliances was able to be carried in an invalid chair about the grounds of Cooper Hospital. Death occurred June 1, 1898.

DISCHARGE BY X-RAYS. Child. *Phys. Rev.*, May-June.—A long article describing experiments with the fall of potential at the surface of a metal when exposed to the discharging action of x-rays. The results are given in curves and tables, and show the following: That there is a large fall of potential at the surface of the metal when the discharge is caused by x-rays; that this fall is diminished by allowing the rays to strike the plate; that it is diminished to the greatest extent in the case of metals which absorb rays most.

THE G. CRAMER DRY PLATE CO. succeeds to the business of the G. Cramer Dry Plate Works, having just been incorporated with a capital stock of $200,000, fully paid up, divided into 200 shares of $1,000 each. These shares are held by G. Cramer, F. Ernest Cramer, Jason C. Somerville and Emile Cramer respectively. The officers of the new corporation are as follows: G. Cramer, President; F. Ernest Cramer, Vice President and Treasurer; Jason C. Somerville, Secretary.

BOOK REVIEW.

Cataphoresis Or Electric Medicamental Diffusion.

BY WM. JAMES MORTON, M. D.,

Professor of Diseases of the Mind and Nervous System and Electro-Therapeutics in the New York Post Graduate Medical School and Hospital; Member of the Medical Society of the County of New York; Permanent Member of the Society of the State of New York; Member and Past President of the American Electro-Therapeutic Association; Member of the New York Academy of Medicine, American Neurological Association, Howard Medical Society of New York City, American Medical Association, Societe Francaise d'Electro-Therapie, New York Electrical Society, etc., etc. Author of The X-Ray or Photography of the Invisible and its Value in Surgery. American Technical Book Co., N. Y. 266 pages, $5.00 net.

First authentic account of cataphoresis is that of Fabre Palaprat experimenting in 1833. He claimed to have placed on each arm a platinum disc—the negative saturated with a solution of potassium iodide and the positive with starch water. Upon application of a current, Palaprat claimed that the starch water turned blue (showing presence of iodine). Dr. W. J. Morton has tried this experiment, but unsuccessfully.

In the Ward Richardson experiments in 1859, with "Voltaire Narcotism", aconite and chloroform were introduced by means of an electric current into the leg of a dog and the leg painlessly amputated after eleven minutes of application.

In 1890 Thos. Edison read before the International Congress at Berlin, a paper on the treatment of gout by lithium salts cataphoretically applied. The patient's right hand was immersed in a jar of sodium chloride, (positive) and the left hand in a jar of lithium chloride, (negative). After applying a current, lithium was found in the urine.

In 1892, an acconnt was published of the experiments of Girtner and Ehrmann, of Vienna. These men introduced corrosive sublimate into the system as a treatment of syphilis, by electric baths. Mercury was found in the urine.

Dr. Morton has demonstrated that the effect of cataphoretic medication does not go more than half the distance from the positive to the negative pole. Cocaine combined with guaiacol is safer to use and the toxic effect of cocaine is minimized.

In making a successful cataphoretic application, the electrical resistance of the fluid plays an important role. If such resistance be very high (chloroform, sulphuric ether, alcohol, glycerine) little or no current is transmitted; but if resistance be too low (strong saline and acid solutions) much current passes but no action takes place. In order to transmit high resisting substances, it is necessary to incorporate them with foreign substances, such as $Na_2 So_4$ or Na cl.

The continuous current from a dry battery (40 cells) is that best fitted for cataphoretic medication. With the battery current we have no unpleasant consequences, such as the "grounding" of the electric light current would produce. A good rheostat is a very necessary adjunct for the outfit.

In using cocaine for local anaesthesia, it is well to fit a piece of blotting paper to a perforated electrode, then drop the cocaine solution upon the blotter until it is saturated. This pole (positive) should be applied to the area to be deadened, and the current applied gradually. The negative pole may be applied anywhere. Bear in mind that the area affected will correspond in size with the electrode. Dentists frequently err in applying a small electrode to a large cavity, whilst an electrode almost as large as the cavity will admit will give better results and larger field of anaesthesia.

Dr. Morton has found the electric current efficacious in removing tumors, treating trachoma and like diseases of eye, nose and throat. It has proven valuable in staining microscopical specimens, &c. For the aching teeth, hydrogen dioxide, cataphoretically applied, has accomplished all that could be desired.

One reason why we fail to employ

electricity, is conservatism, due to lack of knowledge of effects. The average physician or dental surgeon would in a very short time master the technique of handling an electric outfit properly and the benefit derived therefrom would be more than compensation for the time expended.

This book of Dr. Morton's is new and original. It is full of useful information which can not be found elsewhere. This character of work is growing in favor, actually becoming a necessity, in the hands of the surgeon and the dentist.

O'HARA.

VALUE OF THE RAYS IN MEDICINE.—In a recent case of torticollis following injury there seemed to be no reason for the condition. An x-ray examination revealed a dislocation of the fourth cervical vertebra. As a rule, any lesion of the vertebra can be immediately recognized by means of the ray.

Gouty lesions of the bones and periosteum can also be readily recognized.

In certain cases it is the only method of diagnosing with certainty aneurism of the aorta. It is also possible to tell if the heart contracts sufficiently and thoroughly empties the ventricles. In pleurisy it is possible to fix the limits of the effusion, and the movements of the diaphragm can also be observed. Cavities in the lungs can be recognized as a clear area, and exudations by a dark shadow.

A novice in the use of the rays may mistake the cartilages of the trachea and bronchi for foci of disease.

The kidneys can be made out, and if they contain calculi these can be found. By filling the stomach with a solution of bismuth its outline can be clearly made out.

Classification of the arteries can be seen with great distinctness.—*M. Rumpf, Independence med.*, October, 1897.

Overcoming High Resistance in Crookes' Tubes.

In THE AMERICAN X-RAY JOURNAL, April, 1898, Dr. Graves makes some very interesting remarks on methods of restoring x-ray tubes which have become "dead" by increase of resistance in use. He considers that by proper treatment any "dead" tube may be made to work again, without exhaustion, or without the use of restoratives, such as vapor emitters in side pockets. Dr. Graves' treatment consists in a rational combination of certain artifices already known and applied separately. The principal artifices employed by Dr. Graves to resuscitate "dead" tubes are reversal, spark gaps, and tin foil on the cathode end of the tube. He finds that in tubes of an ordinary resistance, the direct resistance is about three times the reversed resistance. When, therefore, the current refuses to pass in the proper direction, the chances are that it will be able to pass when it is sent in the reverse direction through the tube. If it is found impossible to send the current through the tube in the reverse direction (when the leads are connected directly to the tube), then success will usually be attained by introducing a spark-gap between the tube and the positive terminal of the generator. Dr. Graves has repeatedly observed that a spark-gap at the negative pole reduces the resistance of a tube, while a spark-gap at the positive pole increases it. The reversed current is sent through the tube till the phenomena observed are the same as when an ordinary tube is reversed. Dr. Graves maintains that tubes that have been resuscitated in this way are far more efficient than new tubes which have not become "dead" by continued use. Dr. Graves' paper is well worth the study of those engaged in practical x-ray work.—*Electrical Review*, London, June 10, 1898.

LOCALIZATION OF FOREIGN BODIES IN THE EYE.

At a meeting of the Section on Ophthalmology, College of Physicians of Philadelphia, held March 15, 1898, a number of interesting explanations and exhibits were made for localization of small bodies.

Dr. Charles L. Leonard exhibited his *apparatus for localization of foreign bodies within the cranium and orbit.* It consists of a yoke that can be firmly fastened to the patient's shoulders, and adjustable upon it an upright frame supporting the plates, and to which the patient's head is firmly fastened by bands. Rigidly connected with this, but adjustable at any angle, in a plane perpendicular to the photographic plates, is an arm which carries the x-ray tube. The relational angle can be read from a divided arc situated at the articulation.

The apices of these angles are marked upon the skin, and shown upon the photographic plates by two lead ferrules, which are placed upon the margins of the plates, and do not, therefore, cast their shadows in the field of observation. They slide upon an aluminum wire permanently placed upon the upright frame. The tube, foreign body, and plates are, therefore, held in known rigid relation to each other and the known point while observations are made, which give data from which their mutual relation may be mathematically determined, or accurately measured by the graphic method.

The sources of error common to other methods avoided by this rigid apparatus are: changes in relation of the tube, foreign body, known point, and plates, by unconscious motion of the patient or during interchange of plates. An additional advantage is absence of all foreign bodies from the field of observation.

The x-ray "burn" is not due to the x-ray, but to the static electric charge induced in the tissues by the high potential induction field surrounding the tube. It is never serious, and may be prevented by introducing a "grounded" aluminum conductor as a shield between the tube and patient.

Dr. Howard F. Hansell reported a case of *diagnosis of the presence of a piece of steel in the left eye* by the x-rays, and its localization by the method of Dr. Wm. M. Sweet. It was extracted from under the lower periphery of the lens after iridectomy by the medium-sized curved tip of the Hirschberg magnet. It weighed 9.5 mg. and measured 4 *x* 2 *x* 9-10 mm. The eye recovered perfectly, although vision is reduced to perception of large objects on account of blood in the vitrious chamber. The x-ray plates unexpectedly revealed the presence of another fragment of steel in the orbit near the external outer angle, of which no history could be obtained. It may have entered contemporaneously with the other injury. Against this supposition is the absence of any external wound, hemorrhage, bruise or contusion, and the second fragment was found after removal to consist of steel of a different character and quality from those of the other. Its localization was demonstrated by response to the magnet, which, when passed over the skin in its neighborhood, was invariably puckered and elevated. With the aid of the magnet it was easily excised and its dimensions were found to be 6 *x* 1 *x* 1-4 mm. and its weight 23.5 mg.

Dr. Wm. M. Sweet reported the results of his experience in the *localization of foreign bodies in the eyeball* by his apparatus. The various methods employed resolve themselves into determination of the angle of the x-ray tube with the foreign body and with dense objects situated near the eyeball. Approximate results have been obtained from a study of the shadow of the foreign body in relation to the shadows of the orbital

bones, but owing to variations in the position of the eyeball, shown by Cohen to amount in healthy individuals to as much as ten mm. behind the edge of the orbit and twelve mm. in front of it, this method does not equal the accuracy possible by other means. Whatever form of indicating object is used in working out the position of the foreign body, certain factors are essential: 1. A tube should be used which may be run at high vacuum, in order that the rays readily penetrate the bones of the head. 2. The patient should be in recumbent posture to ensure steadiness of head and body. 3. The visual axis should be parallel with the plane of the plate at the side of the head, or, if it deviates, the angle should be measured and allowed for in the determinations. 4. The situation of the indicating objects with respect to the center of the cornea in each individual case should be known; otherwise determination of the location of the foreign body will vary with the varying situation of the eyeball in the orbit of different persons. 5. The angle of the tube with the indicating objects must be accurately measured. The two indicators being parallel with each other and with the plate, the distance the shadow of one of the balls is posterior to that of the other is the measure of the distance that graphic plate and the indicating objects, and also the varying position of the eyeball in different individuals with respect to the external orbital angle.

[The Dennis Fluorometer is the only invention that will accurately locate foreign bodies at any distance from the tube and at any distance from the sensitized screen. The instrument is simple and easy to manipulate and is mathematically correct.—ED.]

ROENTGEN SOCIETY.—At the meeting of this society held at 11, Chandos Street, Cavendish Square, W., on Tuesday, 7th inst, papers were read by Mr. T. C. Porter on "Work on the X-Rays," and Mr. A. A. Campbell Swinton, on "A Pin-hole Roentgen Ray Camera and Its Applications." David Walsh, M. D., is Hon. Sec'y. of the society.

ROENTGEN RAYS IN WARFARE.—Before the Royal United Service Institution on Friday last, Surgeon-Major Beevor, M. B., Army Medical Staff, lectured on the "Working of the Roentgen Ray in Warfare." The lecturer said, according to the *Times* report, that his object was to give his experience in the working of the x-ray in military surgery, and through the kindness of many official friends he would be able to give the audience the results of its employment on the recent frontier expedition in India, and then to lay before them some modifications in the construction of the appliances for generating the x-ray which had suggested themselves to him after working among the wounded on the field of battle and its adjacent hospitals. He then exhibited, by means of the magic lantern, photographs of cases from the Frontier War, which showed with the utmost clearness the importance of the use of the x-ray in the treatment of wounded men. The positions of bullets in various parts of the body were made perfectly evident in cases where it was quite impossible to localize the bullets by ordinary surgical methods. The lecturer said that it was not only possible, but quite easy to have an x-ray apparatus working at the front. The cases exhibited contained indisputable proof that even in savage warfare, where the Geneva Convention was unknown, the x-ray could be brought under control, and an immensity of human suffering obviated; it was not necessary that every field hospital or bearer company should be supplied with an apparatus, as it could be readily transported from one part to another of the field of operations. He felt sure they would see what an advantage

it was to be able to localize bullets, and other foreign bodies, without the painful process of searching with probes, and that a threefold advantage was gained in the treatment of patients by this means —first, the absence of any pain or physical injury, from which arose the second advantage, that in cases where there had been much loss of blood or injury to bone, they were enabled to ascertain the exact condition of affairs, without the risk of increasing the depression of the patient by operation, and they thus gave him the best chance of reaction, upon which depended his recovery. He maintained that it was now the duty of every civilized nation to supply its wounded in war with an x-ray apparatus, among other surgical aids, not only at base hospitals, but close at hand, wherever they might be fighting and exposing themselves to injury in the performance of hazardous duty. The rest of the lecture was devoted to consideration of technical questions in connection with the appliances required for generating the x-ray.—*Electrical Review*, London.

An X-Ray Cinematograph.—Dr. John Macintyre, of Glasgow, presented before the Glasgow Philosophical Society an x-ray cinematograph. The experiment was made on the hind limbs of a frog, and the photographs were recorded on a film 40 feet long.

When this film was passed through a cinematoscope, illuminated in the ordinary manner, the movements of the frog —that is, of the skeleton of the frog— were plainly shown.—*Arch. of Skiagraphy*, April, 1897.—F.

Fluorescent Screen. *L'Ind. Elec.*, Feb. 25.—A note stating that according to Ducretet opaque celluloid, such as used for collars and cuffs and called in France, "American Linen," becomes very fluorescent in the presence of x-rays.—*The Electrical World*, March 19.

True Americanism.

Physicians and pharmacists, like the masses of the people, have tired of the arrogation of superiority implied by the announcements of foreign manufacture, and are revolting against them. This spirit is especially commendable at the present time when a vast wave of patriotism is rolling over the land, making the North and the South, the East and the West as one band of brothers by its magic influence. The Antikamnia Chemical Company, of St. Louis, in all of its advertising matter, whether through the journals or by circular, takes particular pains to impress upon physicians and pharmacists that its goods are made in America, by Americans, and for American use. This enterprising Company realizes that the words "made in Germany, "or made in France" no longer possess the influence and meaning they once had. The people of this country no longer scorn or underrate the products of their own native laboratories and work shops.—*The National Druggist.*

A Useful Chart.

Write to the Imperial Granum Food Company, New Haven, Conn., for sample copies of their new "Nursing World Fever Chart" for recording the vital signs and other information relating to the Baths given in the treatment of fever cases. It is very complete and will be found especially useful in typhoid fever.

Polk's Medical and Surgical Register of the United States and Canada is now undergoing its fifth revision. Physicians who have not given their names to the canvassers are urged to report to headquarters at once, giving full information. Address, R. L. Polk & Co., Detroit, Mich.

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